Events and verb classification*

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Abstract

The prevailing approach to understanding the syntactic mapping of arguments and argument alternations is to assume that verbs are organized into semantically distinct verb classes and that class membership determines the grammaticality of argument alternations. This paper presents syntactic evidence that verb-class membership cannot explain the causative and locative alternations, and that alternate mappings are based on the characteristics of the particular event the predicate denotes rather than on the verb's semantics. Once argument mapping is understood properly as implicating event structure, verb classes become superfluous, and one need not posit alternation operations that create a derived form from a more basic lexical item. I further argue against universal mapping principles based on semantic roles, such as Baker's (1988) UTAH, and for universal event-based mapping principles. Finally, I show that a theory of event-structure mapping has broad implications for acquisition.

1. The argument alignment problem

Our knowledge of language specifies how to use verbs and their arguments in the syntax, including the relation among the verb, its arguments, and the syntactic position that arguments appear in. This paper addresses the form of this knowledge and the types of computations that support verb use. I will argue that characteristics of the event drive the lexicon-to-syntax mapping, and that the mapping principles use contextual information about the event and are therefore computational. The event-structure approach to mapping relations obviates the need to posit verb classes and verb alternations in linguistic representation.

The prevailing approach to the lexical-syntactic relations posits a combination of semantically defined universal mapping principles and seman-

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tically based classes of verbs that behave in uniform ways syntactically. I call this approach to mapping the *verb-class model*. The uniform tendency for certain semantic (thematic) arguments to appear in certain syntactic positions has led to the postulation of a set of universal mapping relations. These include Perlmutter and Postal's (1984) *universal alignment hypothesis* (UAH) and Baker's (1988) *uniformity of theta assignment hypothesis* (UTAH). The two hypotheses are reproduced in (1) and (2).

(1) *Universal alignment hypothesis* (UAH):
There exist principles of universal grammar that predict the initial relation borne by each nominal in a given clause from the meaning of the clause (Perlmutter and Postal 1984: 97).

(2) *Uniformity of theta assignment hypothesis* (UTAH):
Identical thematic relationships between items are represented by identical structural relationships between those items at the level of D-structure (Baker 1988: 46).

The U(T)AH states that specific semantic arguments belong in specific syntactic positions, and that there is a one-to-one mapping between semantic argument and initial syntactic position. Universal alignment predicts identical mappings of arguments into syntax across verbs and across languages.

In a sentence like (3), for example, the verb *build* selects two arguments, an agent and a theme. The U(T)AH determines that the agent (*John*) appears in subject position and the theme (*the house*) appears in object position. The U(T)AH supports a movement-based account of the sole argument of unaccusatives like that in (4). Because of universal mapping, the theme subject must originate in object position; it then moves to subject position to satisfy such syntactic requirements as case theory and the extended projection principle.

(3) John built a house.
(4) The windows fell out of the Hancock Building.

Any theory of argument realization must account for a number of properties, including

i. the semantic uniformity of mappings across languages;
ii. the multiplicity of mappings observed for individual verbs;
iii. the distribution of grammatical and ungrammatical mappings;
iv. the ability to create new syntactic frames for a given verb;
v. the acquisition of verb use, uniform mappings, multiple mappings, and creative usage.

Hypotheses about uniform alignment such as U(T)AH conflict with the fact that semantic arguments sometimes appear in alternate syntactic

positions. The present paper addresses this conflict by describing two models of argument mapping, first the semantically based *verb-class model*, and second an aspectually based *event-structure model*. I present a combination of theoretical and empirical arguments that demonstrate that the event-structure model best accounts for the five properties of argument mapping listed above.

A common solution to the failure of U(T)AH to explain the evident variability of the syntactic positions of semantic roles is to posit the existence of semantically defined classes of verbs.[1] Each class of verbs defines a set of mapping relations and argument *alternations* that derive new lexical items and new mappings. The verb-class model looks for verbs that behave alike syntactically and posits a semantic basis for their behavior (e.g. Levin 1993; Levin and Rappaport Hovav 1995; Perlmutter 1978; Rappaport and Levin 1988; Pinker 1989; Gropen 1993). The ultimate goal of the verb-class model is to find semantic generalizations underlying the verb classes that predict which verbs allow alternations and which do not. The verb-class model implies that knowledge of lexical syntactic relations includes a set of semantically based classes, category membership for all verbs, and a set of operations that derive alternate mappings.

The many problems with a verb-class approach primarily result from the fact that there is not a one-to-one correspondence between verbal semantics and syntactic behavior. First, semantic analysis has proven incapable of predicting verbal behavior because semantically similar verbs may allow different mappings. Second, many verbs cannot be assigned rigidly to a single class; instead, their behavior is variable and context-dependent, which directly contradicts the verb-class model and hypotheses about semantically based universal alignment. Third, speakers are able to invent, or adopt, new syntactic frames for verbs that conflict with their normal usage. Finally, the verb-class model presents a horrendous acquisition problem: each child first must construct an identical set of verb classes and then must assign verbs correctly to these classes.

Because the verb-class approach neither describes the syntactic facts adequately nor solves the learning problem, I conclude that verb classes do not exist as a cognitive or linguistic organizing mechanism but are instead an epiphenomenon of descriptive work on lexical semantics, argument structure, and verbal alternations. Verb classes are inventions of linguists that describe (in some cases incorrectly) the behavior of verbs. Because work on verb semantics provides us with a descriptive tool that helps us understand the mechanisms that govern verbal behavior, the work on verb classes has been invaluable. However, verb

classes have no explanatory power, and therefore they do not help us understand the computational system.

The term *alternation* implies that the verb has a basic form and mapping from which an alternate syntactic mapping or argument realization may be derived. I will argue that mapping always follows general principles and that verbs and their various mappings are not derived. Therefore, I will use the more neutral term *alloframe* to refer to the various syntactic frames that the arguments of a verb may map into. Two examples of alloframe variation that I will address are the English locatives and causative/inchoatives. (See Levin [1993] for a particularly complete description of verbal diathesis in English.)

The many shortcomings of the verb-class model suggest that mapping principles should be defined independently of verb classes. I will argue that arguments are mapped not from the lexicon, but rather from *event structure* directly into syntax.[2] The semantics of the verb and its arguments are only relevant insofar as they are able to constrain the set of event structures. I call this the *event-structure model.*

The claims made here are consistent with the general conclusions of Tenny (1987, 1994) and van Hout (i.p.). Tenny proposes that the mapping of verbal arguments follows aspectual principles rather than thematic principles.[3]

(5) *Aspectual interface hypothesis* (AIH):
The universal principles of mapping between thematic structure and syntactic argument structure are governed by aspectual properties. Constraints on the aspectual properties associated with direct internal arguments, indirect internal arguments, and external arguments in syntactic structure constrain the kinds of event participants that can occupy these positions. Only the aspectual part of thematic structure is visible to the universal linking principles (Tenny 1994: 2).

The AIH explicitly denies that semantic or thematic roles play any part in determining the mapping of arguments into the syntax. Van Hout (i.p.) also argues that thematic roles are not relevant to mapping, but that mapping is guided instead by event roles.

The event-structure model that I will present completely excludes event information from the lexical semantics of a verb. I argue that event structure determines the mapping of arguments into the syntax, and further that event structure must reside outside the lexicon, as a separate level of representation.[4] Lexical information may constrain the range of possible event structures in various ways (Ritter and Rosen 1993a), and I suggest how it can do so in the sections that follow, but

the lexicon plays no direct role in the mapping. Further, the event-structure model is compatible with a strong form of universal alignment: all argument realization derives from one set of mapping principles, event-based principles, without exception and without the participation of verb classes.

Unlike theta theory and the definition of semantic roles, the theory of event structure is quite new and has not yet been cast in a standard form. However, recent research has revealed some basic principles of event structure. Grimshaw (1990) has argued that the event role *causer* is assigned to the argument that initiates or launches an event, and that the causer role is mapped to the external argument position. Tenny's (1987, 1994) work has demonstrated the importance of two other event roles: the *delimiter* terminates an event, and the *measure* gauges the unfolding of the event by undergoing motion or change. She argues that the measure maps to direct object position, and the delimiter maps to an internal argument position (either the direct or the indirect argument).

Using these three event roles, we can define a set of universal mapping principles:

i. *Causer* maps to the external argument position.

ii. *Measure* maps to the direct internal argument position.

iii. *Delimiter* maps to an internal argument position — direct if it measures the event, indirect if it does not.

Critically, these event-based mapping principles operate independently of semantic roles. Thus, if an instrument is interpreted as a causer, it will map to subject position (*the key opened the door*), and if a locative measures an event, it will map to direct object position (*Bill sprayed the wall with paint*).

The following contrasts the verb-class model and the event-structure model of argument mapping.

Verb-class model of mapping

(i) Lexicon determines mapping via thematic roles.
(ii) Constraints are semantic.
(iii) Many semantic constraints are learned.
(iv) Mapping and alternations depend on verb-class membership.
(v) Semantic properties of a verb are many in number, complex, and subtle.
(vi) Model postdicts a new verb's behavior. Prediction is ultimately possible if underlying semantic generalizations are identified.

Event-structure model of mapping

(i) Event structure determines mapping.
(ii) Constraints are event-based.

(iii) Event structure constraints are universal.
(iv) Mapping and alloframes depend on sentential event.
(v) Event-structure properties are few in number, simple, and obvious.
(vi) Model predicts the allowable alloframes of a new verb based on sentential event.

Sections 2 and 3 examine two alloframe types, causatives and locatives, and show that both are constrained by the role each argument plays in the event, thereby demonstrating that verb classification systems misattribute control over mapping to semantic properties. I will show that the event-structure model best captures the facts concerning the syntactic behavior of arguments.

2. Event constraints on causativization

2.1. *The lexical causative*

Semantically based descriptions of lexical causatives cannot adequately determine which verbs allow a causative to be added and under what conditions causativization is permissible. Semantically based approaches are inadequate because the constraints on causativization are sensitive at least in part to the properties of the event denoted. In particular, the ability of a verb to causativize depends on whether the verb denotes a delimited action.

The lexical causative alloframes are illustrated in (6) and (7). Causativization appears to be a transitivizing operation in which a causer argument is added to a verb. Within a semantically based verb-class model, many of the verbs whose semantics denote a change of state (such as the unaccusative verbs in [6]) allow a causer to be added, and the causer becomes the external argument (as in [7]).

(6) a. The window broke.
b. The door opened.
c. The ice melted.
(7) a. John broke the window.
b. John opened the door.
c. John melted the ice.

In contrast to change-of-state verbs, many activity verbs (unergatives), in which the subject is an agent, do not allow the addition of a causer. This is exemplified in (8) and (9).

(8) a. Sue danced.
b. The horse jumped.
c. Bill walked.
(9) a. *Bill danced Sue.
b. ??The trainer jumped the horse.
c. *Sue walked Bill.[5]

The examples in (10) and (11) show that the verb itself does not determine whether causativization is possible. Rather, the entire VP context affects whether verbs like those in (8) and (9) allow causativization:

(10) a. Sue danced across the room.
b. The horse jumped over the fence.
c. Bill walked home.
(11) a. Bill danced Sue across the room.
b. The trainer jumped the horse over the fence.
c. Sue walked Bill home.

Examples like those in (10) and (11) were pointed out by Brousseau and Ritter (1991) for English[6] and subsequently described by Levin and Rappaport Hovav (1995) as requiring the goal or path. Levin and Rappaport Hovav suggest that when the goal or path is added to a verb like *dance*, *jump*, or *walk*, these verbs switch from the class of unergatives to the class of unaccusatives.

Within the verb-class model, there are two fairly thorough proposals to describe the causative "alternation," that of Levin (1993) and that of Pinker (1989). Levin lists 19 alternating subclasses of verbs and 15 nonalternating subclasses, each with between two and 93 members; Pinker lists four alternating subclasses and five nonalternating subclasses, each with between four and 20 members. Membership in classes and alternatability of the class solely determines whether a particular verb can be causativized.

The verb-class approach can cope with the facts in (8)–(11) only by postulating that the addition of a goal or path argument causes activity verbs to switch verb classes, from one that does not allow causativization to one that does. That is, either class membership is unstable or the entire VP determines class membership. Either way, the result is quite complex and counter to the position that verb semantics determines syntactic behavior. The verb-class model provides no *a priori* way to determine when there has been a semantic class shift and when there has not.

An unergative-to-unaccusative switch may accurately DESCRIBE the behavior of such verbs, but it fails to EXPLAIN the phenomenon. An important observation about the sentences in (11) is that the verb is interpreted not as an ongoing activity, but as a completed, delimited event. For example, in (11a), *dance across the room* means 'travel across the room by dancing', not an ongoing activity. The means-of-reaching-a-location interpretation of the verbs in (11) plays an important role in the ability of the verb to causativize.[7]

The sentences in (6) and (7) and those in (10) and (11) all have an event-structure similarity not shared with (8) and (9): the verbs that causativize all denote delimited action. A *delimiter* is an argument whose role is to define when the action denoted by the verb is complete (Tenny 1987, 1994). According to Tenny, a delimiter can be specified either (i) via an item that changes state (an affected object), or (ii) via the addition of an oblique argument, which will serve to denote when a particular event ends.

The difference between the examples in (8)–(9) and (10)–(11) is largely aspectual. Thus, while the contrast may be described as changing the verb's classification (e.g. Levin and Rappaport Hovav's unergative-to-unaccusative shift), what is important is that the goal phrase changes the aspectual nature of the verb. An activity verb, according to Dowty's (1979) aspectual classification system, has no specified end — it is atelic or undelimited. For sentences like those in (11), the verb no longer behaves like a simple (atelic) activity. A verb that describes a means-of-reaching-a-location denotes a delimited, or telic, event. As van Hout (i.p.) points out, a causativizable predicate always denotes a delimited event. Verbs that describe a change of state like those in (6) have a delimiter and hence meet the requirements of lexical causative formation. The goal phrase in (10) functions as a delimiter, and hence these verbs now meet the requirements of lexical causative formation.[8]

The adverbial modification test described in Dowty (1979) corroborates the claim that the causatives in (11) denote delimited events. In the examples in (12)–(14), the use of the time adverbial *in X time*, with the reading in which the event takes place only during the course of that time, is available only for delimited events. (The adverbial *in X time* contrasts with *for X time*, which modifies undelimited events.) Notice that the same verbs without the delimiter and those with a nondelimiting PP neither pass Dowty's test for delimitedness nor allow the causative.

(12) a. *Sue danced in 15 minutes.
b. Sue danced around the room in 15 minutes.
c. Bill danced Sue around the room in 15 minutes.

d. *Sue danced along the hall in 15 minutes.
e. *Bill danced Sue along the hall in 15 minutes.

(13) a. *The horse jumped in a split second.
b. The horse jumped over the fence in a split second.
c. The trainer jumped the horse over the fence in a split second.
d. *The horse jumped around the corral in a split second.
e. *The trainer jumped the horse around the corral in a split second.

(14) a. *Bill walked in an hour.
b. Bill walked home in an hour.
c. Sue walked Bill home in an hour.
d. *Sue walked along the beach in an hour.
e. *Bill walked Sue along the beach in an hour.

The data presented here have demonstrated that whether or not a given verb allows both alloframes depends upon the specific event that the verb denotes in a given use, and upon the specific role each argument plays in that event. Thus, the two alloframes are the result of mapping principles that are controlled by highly specific event characteristics of the predicate. The event-structure model predicts that any verb whose event can be delimited will allow causativization of the delimited event.[9]

2.2. *Unusual instances of causativizing events*

At this point, we have seen that a verb with a specified delimiter will allow causativization. The delimitation constraint on causativization implies that if a verb cannot be delimited, it will not permit causativization. This section shows that nondelimited events never causativize.

Pinker (1989) and Levin and Rappaport Hovav (1995) note that some activity verbs never undergo causativization; such verbs include *smile*, *cry*, *laugh*, *glow*, and *glitter*. The causative form of these verbs is not licensed by the addition of a goal:

(15) a. *Bill smiled John.
b. *Bill glowed John.
c. *Bill ate John (cf. 'Bill fed John').

(16) a. *Bill smiled John to Dodge City.
b. *Bill glowed John to Dodge City.
c. *Bill ate John to Dodge City.

The data in (15) and (16) are predicted by the event-structure model:

to Dodge City cannot serve to delimit the event, and therefore the lexical causatives in (16) are correctly predicted to be ungrammatical. The predicates that allow causativization, such as those in (11), denote a delimited event: while one can conceivably get to Dodge City by dancing or walking, one cannot get there by smiling or by glowing, and therefore Dodge City does not delimit the event. Notice that in (17), the simple activity verb cannot take a delimiting goal argument either. For such activity verbs, there is no way to add a proper delimiter to the predicate, and therefore the predicate is not causativizable.[10] Notice, too, that the adverbial *in an hour* cannot be used to modify these predicates, again indicating that they are undelimited.

(17) a. *John smiled to Dodge City (in an hour).
b. *John glowed to Dodge City (in an hour).
c. *John ate to Dodge City (in an hour).

Although *smile* cannot denote a delimited motion, it can denote an event of reaching an abstract goal, as the example in (18) indicates: while smiling will never get a person to a geographical location, it may get one to a certain social or professional position. Levin and Rappaport Hovav (1995) point out that the fake reflexive in this example allows a resultative to be added to an otherwise unergative predicate. In our terms, it allows an activity to be delimited; the resultative is the delimiter. Thus, this example falls perfectly within the delimitation requirement on causativization.

(18) John smiled himself into his leading position in just one year/*for just one year.[11]

There are other verbs, like those in (19), that occasionally causativize even though they ordinarily denote undelimited activities. Such examples include (19a), apparently spoken by many parents, and (19b), an utterance I produced when I was giving my son inhaler treatments.

(19) a. The sitter finally slept the baby.
b. I inhaled the baby at 10:30.

In each case, the event denoted by the verb defines not an ongoing activity, but a delimited event. The event in (19a) is not the unbounded sleeping event initiated by the sitter. Instead, the event denotes the antics the sitter must go through in order to cause the baby to fall asleep. Once the baby has fallen asleep, the event of "sleeping" the baby is completed. Similarly, to "inhale" the baby means to give the baby a specific inhaler treatment, another delimited event. Notice that

(20) shows that both events are delimited according to Dowty's (1979) adverbial modification test.

(20) a. The sitter can sleep the baby in 5 minutes/*for 5 minutes.
b. I inhaled the baby in 10 minutes/for 10 minutes.[12]

Finally, an anonymous reviewer suggests that undelimited activities like the German verbs *fahren* 'drive' and *fliegen* 'fly' allow a causative to be added. It is true that such verbs causativize, as shown in (21a), but only under very unusual circumstances: careful consideration of (21a) reveals that it has one of two interpretations. One is a habitual interpretation that does not describe an event at all (meaning that Peter frequently serves as Maria's chauffeur or pilot). The habitual interpretation may account for the reduced acceptability of (21b), which adds the adverbial that modifies only delimited events in (21b); nonevents cannot be delimited. To the extent that the alternative, event interpretation of (21a) is good, it requires a highly constrained discourse context, with a clear goal: the event interpretation involves ellipsis of the delimiter. In English, unlike the German, the simple present only allows the habitual reading; however, the ellipsis interpretation obtains with the simple past (*Peter drove Maria*). The ellipsis reading in (21c) allows the delimited adverbial modifier.

(21) a. Peter fährt/fliegt Maria.
'Peter drives/flies Maria.'
b. ??Peter fährt/fliegt Maria innerhalb von einer Stunde.
'Peter drives/flies Maria within one hour.'
c. Did Maria get to the airport on time?
Yeah, Peter drove her in an hour.

2.3. *Unusual instances of noncausativizing events*

There are delimited verbs that fail to undergo lexical causativization; these include *die*, *disappear*, *vanish*, *appear*, *fall*, *arrive*, *come*, *go*, *happen*, and *find*.[13] To the extent that these verbs denote delimited events, the event-structure model predicts that they will undergo causativization, but they never do, as the examples in (22) and (23) show.

(22) a. The buffalo died.
b. *The white man died the buffalo (cf. 'The white man killed the buffalo').

(23) a. John disappeared.
b. *Melvin disappeared John.

It is clear that delimitation is not the sole condition on causativization. There is, in fact, no expectation that the delimitation condition be the sole criterion for causativization. Such additional constraints may be based on event structure, but they may also be semantic. I now suggest some additional constraints that may help determine causativizability.

One explanation for the failure of causativization of a verb like *die* depends on blocking (as defined by Aronoff 1976). The idea is that the causative is blocked by the existence of a more specific, causative lexical item (i.e. *kill*). A blocking account invokes Kiparsky's (1982) elsewhere condition in the lexicon, which states that specific operations have precedence over (block) general rules or principles. Although a blocking explanation is not intuitively satisfying, it has been invoked in other parts of the grammar, for example in explaining the lack of regular morphology when an irregular exists (e.g. Aronoff 1976; Pinker 1989; Marcus et al. 1992). Because blocking appears to be needed elsewhere to explain lexical idiosyncrasies, it would not be too costly to invoke such a principle here.

Disappear, however, is a different story. Unlike *die*, there can be no blocking mechanism at work because no lexical item means 'cause to disappear'. Thus, the blocking account is incomplete at best in explaining the lack of a lexical causative of these verbs.

A second approach would be to posit that all verbs that allow both causative and inchoative are underlyingly causative and a process of decausativization derives the inchoative from the causative. But the same problem arises for verbs that are always transitive: we would be left with no explanation for the failure of detransitivization.[14]

Finally, Levin and Rappaport Hovav (1995) argue that causativizability is based in part on the ability of the change of state to be controlled by an entity external to the changed item. On their account, the item either must have no control over its own change or must be able to relinquish that control. One convincing argument that they give is the fact that certain verbs disallow the inchoative use if change requires external intervention. As the examples in (24) and (25) show, when peeling paint, the causative and inchoative are both possible, but when peeling oranges, only the causative is possible. Levin and Rappaport Hovav would argue that the difference is due to the fact that oranges require the intervention of an agent in order to become peeled, and therefore the control is necessarily external.

(24) a. The paint peeled off the wall.
b. Bill peeled the paint off the wall.

(25) a. *The orange peeled.
b. Bill peeled the orange.

What's interesting about the examples in (24) and (25) is that the internal/external control constraint does not affect the causative use of *peel*; rather it disallows the inchoative use of *peel*.[15] Neither delimitation nor causativization is at issue. Therefore, these examples support the view that there is more than one constraint on the syntactic realization of causatives and inchoatives.

Another indication that causativization is sensitive to more than delimitation is the fact that *disappear* and *grow* do causativize under certain circumstances. Sentences like (26a) have become commonplace in certain political arenas, and (26b) is a bumper sticker I saw recently. *Grow* is an interesting example, because while it is commonplace to causativize *grow* in the horticultural sense, it is generally not possible to causativize the term in describing the growth of anything other than plants. However, in the last US presidential election, one candidate used *grow* in the sense of (26c). It is not totally clear why verbs in (26) generally do not causativize, or why these particular instances are good, but it is clear that it has nothing to do with the delimitation requirement on causativization. Perhaps once we fully understand the additional requirements on causativization, we will come to some understanding of creative and unusual uses like those in (26).

(26) a. The government disappeared him.
b. Disappear fear.
c. Clinton promised to grow the economy.

2.4. *Morphological/syntactic causatives*

Sections 2.1–2.3 argued that lexical causativization is constrained by event structure rather than semantically based verb classification. Morphological causatives turn out to be sensitive to a different set of event-structure constraints.

Many languages have a morphological or syntactic causative, which adds a causer argument by attaching a causative morpheme to the main verb, or adding an independent (auxiliary) verb. This operation has been analyzed in various ways as a morphological process (Di Sciullo and Williams 1987; Shibatani 1976), an argument-structure process (Farmer 1984; Rosen 1990 [1989]; Zubizarreta, 1985, 1987), and a syntactic process (Baker 1988; Burzio 1986). In some languages the causative appears as an affix on the main verb (e.g. Japanese, Korean, Turkish, Kinyarwanda, etc.), and in some it appears as an independent verb (e.g. Romance and English).

Regardless of which analysis of the morphological or syntactic causative is correct, the addition of the causative predicate and the argument

that it imparts is not totally free. Ritter and Rosen (1993b) discuss the conditions under which addition of a morphological or syntactic causative is possible. They show that the causative use of *have* can only be added to a verb that already has a *cause*:

(27) a. The migrant workers tilled the fields.
b. Melvin had the migrant workers till the fields.
(28) a. Melvin washed the dishes.
b. Sue had Melvin wash the dishes.

However, Ritter and Rosen note that combining *have* with a noncausative (nonagentive) verb cannot result in a causative interpretation:[16]

(29) a. The sunflowers grew all across the prairie.
b. *John/*the warm sunshine had the sunflowers grow all across the prairie.
(30) a. The window broke.
b. *John/*the tornado had the window break.

Ritter and Rosen also show that *have* can combine with a (lexically) causativized verb and receive a causative interpretation:

(31) a. The gardener grew sunflowers in the field.
b. John had the gardener grow sunflowers in the field.
(32) a. Mary broke a window.
b. John had Mary break a window.

Similar facts obtain in the causative constructions in other languages, as Ritter and Rosen point out. The French causative verb *faire* cannot combine with a noncausative (nonagentive) verb in French such as *aller* 'go', but does combine with the more agentive *partir* 'leave'. Similarly, the Japanese causative morpheme *-sase* does not get a causative reading when it combines with a noncausative nonagentive verb; instead, it receives an experience interpretation, much like *have* in English.

I conclude, along with Ritter and Rosen, that the morphological causative is only possible when the verb already has a causative or agentive reading. The verb-class model would demand that language knowledge include one set of classes for purposes of determining which verbs undergo the lexical causative, and a different set of classes for purposes of determining which verbs undergo the morphological causative. Thus, *grow* would be placed in a semantic class of verbs that undergo lexical causative, and in a semantic class of verbs that undergo the morphological causative (for the variant in which it takes *have*), and a class of verbs that do not undergo the morphological causative (for the variant in which it does not take *have*). In order to maintain the

verb-class model, one would have to posit at least two lexical items, $grow_{\text{inchoative}}$ and $grow_{\text{causative}}$, and assign them to distinct classes defined for each causative operation. The verb classes must be assigned according to syntactic behavior rather than on any inherent semantic specification of the verb.

The alternative to proposing underlying polysemy and multiple class assignment of verbs is to define two sets of event-based constraints, one for lexical causatives and one for morphological causatives. The event-structure model suggests that operations vary in terms of the particular aspects of the event, such as *cause* and *delimit*, that each operation is sensitive to. Causativization takes place in the mapping process: the lexical causative mapping specifies that a causer argument can be added to a predicate that includes a delimiter; the morphological causative mapping specifies that a causative morpheme and a causer argument can be added to a predicate that includes a causer.

3. Event constraints on mapping of locatives

3.1. *The locative alloframes*

The so-called "locative alternation" applies to a set of verbs that denote the addition or removal of material to or from a flat surface or container and involves an apparent exchange in the grammatical function of two internal arguments. As shown in (33a), the theme argument may appear in direct object position, with the location argument in oblique position, marked with a locational preposition (the theme-object alloframe). Alternatively, the location can appear in direct object position with the theme in oblique position, marked with the preposition *with* (the location-object alloframe). Examples appear in (33b).

(33) a. The farmer loaded $\text{wheat}_{\langle\text{theme}\rangle}$ onto the $\text{truck}_{\langle\text{location}\rangle}$.
b. The farmer loaded the $\text{truck}_{\langle\text{location}\rangle}$ with $\text{wheat}_{\langle\text{theme}\rangle}$.

It has been noted many times (e.g. Anderson 1977; Jackendoff 1990; Pinker 1989; Rappaport and Levin 1988; Tenny 1987, 1994) that the location that appears in direct object position is interpreted as completely affected by the action of the verb.[17] If the verb's action (*load* in [33b]) does affect the location/container (*the truck*), then the container appears in object position. If the location is not completely affected, then it cannot appear in object position, leaving the theme-object alloframe in (33a) as the only one possible. Tenny (1994) argues that a purely aspectual principle controls the syntactic position of the theme

and location arguments: the item that changes state and delimits the action (her *measure*) appears in the direct object position. Her definition of measure (which is reproduced in [34]) specifies that the direct object is the position assigned to arguments that (i) mark the unfolding of an event and (ii) may mark the delimitation of the event.

(34) *Measure* (def):
- (i) The direct internal argument of a simple verb is constrained so that it undergoes no necessary internal motion or change, unless it is motion or change which "measures out the event" over time (where "measuring out" entails that the direct argument plays a particular role in delimiting the event).
- (ii) Direct internal arguments are the only overt arguments that can "measure out the event."
- (iii) There can be no more than one measuring-out for any event described by a verb (Tenny 1994: 11).

Tenny identifies three ways that an argument can "measure out" an event: (i) incremental themes (as defined by Dowty 1991) are either created or consumed in the course of the event; (ii) changes of state undergo some property change; (iii) routes or paths provide a measured gradient along which the event progresses.

In the theme-object alloframe, (33a), the theme (*wheat*) measures the event because it undergoes a change of location and delimits the event — when the wheat is all moved, the loading is complete. In the location-object alloframe, (33b), the location (*the truck*) measures the event because it undergoes a change of state from empty to full, and the relative fullness of the truck delimits the loading event.

3.2. *Aspectual particles*

Many verbs denote the addition or removal of material to a flat surface or container but do not allow both alloframes. As examples, the verbs in (35)–(37) allow only the theme-object alloframe and are generally called "nonalternating verbs" (cf. Pinker 1989).

(35) a. The children taped pictures on the wall.
b. *The children taped the wall with pictures.

(36) a. Gertrude sewed buttons on the dress.
b. *Gertrude sewed the dress with buttons.

(37) a. Bill wound tape around the pencil.
b. *Bill wound the pencil with tape.

According to the verb-class model of alloframe variation, the speaker possesses mental lists of verbs partitioned into classes that are defined as alternating or nonalternating. Two works have classified verbs that do and do not enter into the locative "alternation" by grouping them according to semantic similarities. Levin (1993) lists 12 alternating and 12 nonalternating locative subclasses, each with between two and 93 members. Pinker's (1989) list includes six alternating and 13 nonalternating locative subclasses, each with between one and 20 members.

The verb-class model assigns verbs to classes and explains their behavior on the basis of class membership. A consequence of the verb-class model is that class membership is fixed. But this is not true: class membership is not as stable as the verb-class model suggests. The verbs in (35)–(37), which are classified as nonalternating, will in fact allow the location-object alloframe under the proper circumstances. In particular, if the location argument is construed as measuring out the verb's action, then the location must appear in direct object position.

(38) a. The children taped *up* the wall with pictures.
b. Gertrude sewed *up* the *entire* dress with buttons.
c. Bill wound *up* the pencil with tape.

The reading attained in the examples in (38) is quite different from those in the corresponding sentences in (35) to (37). In (38a), one envisions a wall completely covered with children's drawings. In (38b), the dress does not just have buttons on it; it is entirely covered with buttons, perhaps as a decoration. And in (38c), the entire length of the pencil is covered with tape. As the examples in (39) show, adding a completive particle to the verb forces a delimited reading of the event, with the location covered, full, or completely affected by the action of the verb.[18] In each example in (38) and (39), the location argument changes state and delimits the event and thus meets Tenny's criterion as a measure. The mapping principle for measures forces the location argument to appear in direct object position.

(39) a. The children taped up the wall with pictures *for an hour/in an hour.
b. Gertrude sewed up the entire dress with buttons *for an hour/in an hour.
c. Bill wound up the pencil with tape *for an hour/in an hour.

There is independent evidence for a relation between the event-role measure and direct object position in these locative verbs. The examples in (38) show that the verb particle *up* has primarily event-structure properties: it can change the aspectual characteristics of the verb,

enabling the location to measure the event. A prediction of the event-structure account of the particle is that the verb-plus-particle should only allow the location-object alloframe, and not the theme-object alloframe. As the data in (40)–(42) show, this prediction is borne out. The theme-object alloframe is only possible in the absence of the particle. When the particle appears the location is constrained by the measure-mapping principle to appear in direct object position.[19]

(40) a. *The children taped *up* the pictures on the wall.
b. The children taped the pictures on the wall.
(41) a. *Gertrude sewed *up* the buttons on the dress.
b. Gertrude sewed the buttons on the dress.
(42) a. *Bill wound *up* the tape around the pencil.
b. Bill wound the tape around the pencil.

3.3. *Verbs disallowing theme–object alloframe*

Some verbs appear only in the location-object alloframe, including *fill* and *blanket*, as exemplified in (43) and (44).

(43) a. *Bill filled water into the glass.
b. Bill filled the glass with water.
(44) a. *The storm blanketed snow onto the wheat fields.
b. The storm blanketed the wheat fields with snow.

The event-structure analysis of locatives states that the location must appear in object position if the container (for a verb like *fill*) or the surface (for a verb like *blanket*) changes state and delimits the action. Verbs like *fill* and *blanket* require the location to be interpreted as the measure. Verbs that allow only the location-object alloframe specify, as part of their meaning, that the location be affected by the verb's action (Jackendoff 1990). I hypothesize that the lexical representation of a verb like *fill* includes a specification that the location (the container) end up completely affected. Likewise, the location for *blanket* (a large flat surface) is specified as completely affected, that is, covered.[20]

Because the location in each case is lexically specified as affected, it changes state and delimits the verb; because the location changes and delimits, it maps to direct object position.[21] The information in the lexical representation of verbs forcing the location to measure the event could be encoded as in (45).

(45) a. LCS representation for *fill*
[[x] cause [y] come to be in $[z]_{full}$]

b. LCS representation for *blanket*
[[x] cause [y] come to be on $[z]_{covered}$]

3.4. *Verbs disallowing location-object alloframe*

Other verbs appear only in the theme-object alloframe. With these verbs, the location can never appear in direct object position. A prime example of such a verb is *pour*, as in (46), which provides a minimal contrast with *fill*.

(46) a. Bill poured water into the glass.
b. *Bill poured the glass with water.

Pour specifies the manner in which the liquid comes to be in the container. As such, it denotes a manner of motion, and the item that undergoes motion (a change of state or location) must appear in object position. *Pour* requires a highly specific and continuous manner of transfer. With *fill*, it does not matter how the liquid gets into the container. It could have been put there by pouring, by sprinkling, or by magic; *fill* focuses on the effect on the container.

I suggest that the LCS representation of a verb like *pour*, as in (47), includes a particular manner of motion.

(47) LCS representation of *pour*
[[x] cause [y] move-by-pouring to be in [z]]

With respect to event structure, the manner of motion specification forces the interpretation of the moved item as undergoing a change of location. The changed item will then map directly to object position.

There are two indications that the LCS specification in (47) is the correct approach. Not only does *pour* resist the location-object frame, the addition of a verb particle provides no help in specifying the location as a delimiter, as (48a) shows. Second, the material undergoing motion can take a modifier like *some* or *a little*, as in (48b), because there is no affectedness condition on the location, and thus *pour* is fully compatible with any amount of water (cf. note 20).

(48) a. *Bill poured *up* the glass with water.
b. Bill poured some/a little water into the glass.

3.5. *Event structure mapping bypasses the lexicon*

A use of *fill* has appeared in the literature (e.g. Pinker 1989: 158) in which the material appears in object position, and the location in oblique,

exactly the form that appears to be incompatible with the lexical semantics of the verb. The verb-class model predicts the sentence in (49) to be ungrammatical. The event-structure model predicts it to be grammatical, but only if portions of the lexical semantic representation of *fill* can be ignored in the mapping process.

(49) Take a little of the mixture at a time and fill it into the zucchini.

Judgments of (49) range from ungrammatical to grammatical.[22] Interestingly, (49) is only grammatical under one reading: the material (in direct object position) must measure the event of filling by undergoing a change and determining the delimitation of the filling event. The material also determines precisely what manner of motion is used: if the mixture is a solid, it is done scoop-by-scoop; if the mixture is a liquid, it is done by pouring. The crucial result of (49) is that all of the mixture must be used. In this example, the semantics of *fill* (i.e. the affectedness requirement on the location) are ignored. This example is important because it indicates that the lexical semantics can be bypassed or ignored in particular instances, but that the event-structure requirements on the argument mapping hold rigidly.

3.6. *Cross-linguistic facts*

Cross-linguistic complexities provide further support for the event-structure model applied to locatives. I have argued that the arguments are mapped according to universal event-structure-mapping principles, with particular lexical specifications constraining the possible mappings and interpretations available for a given verb. Because lexical specification is particularly prone to cross-linguistic variation, I would expect to find similar verbs to behave differently across languages, but for mapping to be constrained by the same event-structure conditions. Indeed the data suggest that verbs that are generally translated as "fill" and "pour" in English do not necessarily behave the way that English *fill* and *pour* do. I will demonstrate the differential behavior of such verbs in Chinese and German and will argue that the differences across these languages are purely lexical and not due to differences in event-structure-mapping principles.

In a recent discussion of locatives in Chinese, Pao (1994) shows that the Chinese verb *zhuang* 'fill' is unlike English *fill* in that *zhuang* allows either the location or the theme to appear in the direct object position of the *ba* construction. The examples in (50) are from Pao (1994: 9).

She adds that both uses of *zhuang* can take an adverbial modifier like *yi shiao-si ne* 'in an hour', indicating that both are delimited.

(50) a. Wo ba shue zhuang zai pinzi li.
I BA water fill at bottle inside
'I have filled the bottle with water.'
b. Wo ba pinzi zhuang le shue.
I BA bottle fill ASP water
'I have filled the bottle with water.'

Pao states that "... 'zhuang' does not necessarily encode the fullness of the container as does English 'fill'" (Pao 1994: 9). It seems that the lexical representation of *zhuang* does not include a specification that the container be full or fully affected in any way by the action of the verb. The realization of the arguments of *zhuang* fits the event-structure model perfectly.

An anonymous reviewer points out that German *füllen* 'fill', like Chinese *zhuang* but unlike English *fill*, allows either the material or the location to appear in direct object position. Further, *giessen* 'pour' allows the locative to appear in object position when the verb includes a prefix *be-* or *über-*. The relevant examples appear in (51) and (52).

(51) a. John füllte Wasser in das Glas.
'John filled water in the glass.'
b. John füllte das Glas mit Wasser.
'John filled the glass with water.'

(52) a. John goss Wasser über die Blumen.
'John poured water over the flowers.'
b. John begoss/übergoss die Blumen mit Wasser.
'John on-poured/over-poured the flowers with water.'

These data present no problem for the event-structure model of syntactic mapping. In all instances the direct object receives a fully affected reading, as expected. It appears that *füllen* permits either alloframe because its lexical representation lacks a fullness specification on its location argument; event structure rather than the lexicon determines which argument is completely affected. And it appears that the prefix on *giessen* in (52) is similar in function to the particle *up* in English: it changes the aspectual interpretation of the verb, allowing the location to be fully affected. If the constraint on the affectedness of the container in a verb like *fill* is correctly assigned to language-specific details of the lexical representation of the verb, then such cross-linguistic variation is fully expected. Languages vary the most in their lexicons, and translation is only approximate.

3.7. *Locatives: summary and conclusion*

The two locative alloframes are not defined over classes of verbs. Rather, the mapping of the arguments is defined over the event roles of measure and delimitation. Further, the locative is not an alternation from a basic to a derived form; each potential alloframe is independently licensed or prohibited by a simple mapping principle. When a location is interpreted as the measure, it must map to object position; when the location is not interpreted as the measure, it must map to oblique position, marked with an appropriate locational preposition.[23]

Thus, verbs are not grouped into classes for purposes of applying alternation rules. Just as in the case of causatives, the locative data indicate that many verbs cannot be classified once and for all according to the alloframes they permit. Instead, the mapping is based on the relation between the lexical semantics of the verb (e.g. whether it includes information concerning the affected nature of its arguments) and the event structure, which includes the contours of the specific event denoted in a particular use.

4. Implications for verb acquisition

4.1. *The verb-class model*

The only comprehensive examination of the acquisition of argument mapping is in Pinker (1989), which presents a model of the acquisition of verbal alternations based on the acquisition of highly specific verb classes. The flow chart in Figure 1 reproduces the essential points of Pinker's verb acquisition model.

The model assumes that the child has access to a set of universal argument-mapping principles based on the thematic roles that the arguments bear. These universal mapping principles provide the child with *a priori* tools for determining where in the syntax a given semantic argument should be mapped.

Pinker proposes that the child learns verbs through a combination of linguistic and cognitive abilities by associating particular words with perceived events, and by building argument structures via semantic-structure hypothesis testing. Once the child builds the semantic (LCS) structures of several verbs, the child notices similarities and differences among verbs. The child then starts grouping similar verbs, eventually creating broad semantic classes. After a number of verbs and their

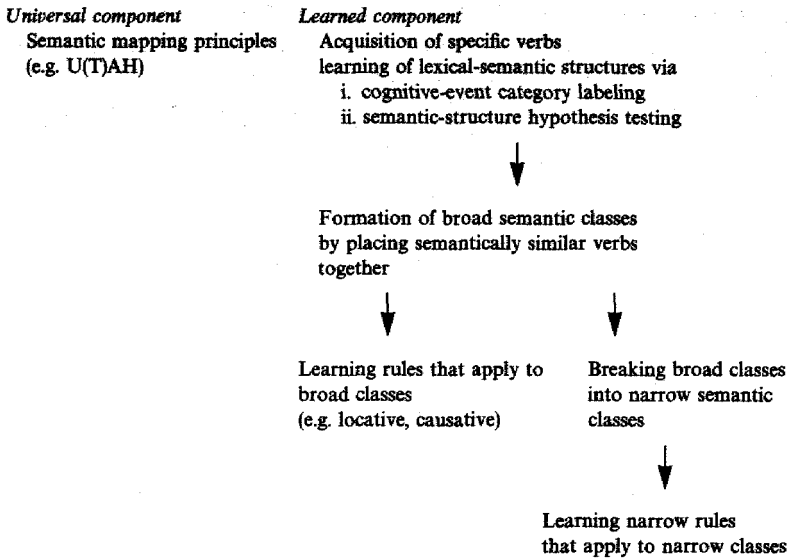

Figure 1. *Verb class model of the acquisition of verbal alternations (Pinker 1989)*

argument structures have been learned, Pinker suggests that the child can also use syntactic bootstrapping to learn argument structures.

Once the child has classified some number of verbs into preliminary semantic classes, s/he is ready to learn and apply argument structure alternation operations for those classes. Pinker calls these initial operations *broad-range rules*. Broad-range rules are alternations defined over broadly defined semantic types of verbs. An example of a broad-range rule is the causative alternation. This rule might be stated, "Optionally add a causer external argument to a change-of-state verb." Once this broad-range rule is acquired, the child can causativize verbs like *break* and *sink*. Another broad-range rule is the locative alternation. The locative rule might read, "Given a predicate that takes a theme and a (container or flat surface) location, optionally place the location in direct object position, and the theme in oblique position marked by *with*." The child equipped with this broad-range locative-alternation rule will know that the verb *load* allows both the theme-object and the location-object variants.

The child is not yet done. Broad-range rules such as the locative or causative rule overgenerate by applying the alternation rules to verbs that do not alternate. For example, the broad-range locative rule will

incorrectly apply to *pour* and to *fill*, both broadly defined as locative verbs. Because broad-range rules do not apply uniformly to the verbs within broad semantic classes, Pinker suggests that the child begins to notice narrowly defined similarities and differences in the semantic analysis of these verbs and responds by dividing the broad classes into subclasses, forming narrow semantic classes. Once the narrow semantic classes are formed, the child then learns whether or not each narrow class undergoes a given argument-structure alternation. Thus, the child constructs *narrow-range rules* that apply to narrow semantic classes of verbs.

The verb-class model of verb acquisition has problems on both empirical and theoretical grounds. First, in sections 2 and 3, I presented data indicating that the verb-class model must place individual verbs in multiple classes depending upon the exact event context in which they are used. As one example, for the broad class of causative/inchoatives, the child would be required to classify verbs such as *jump*, *dance*, and *walk* (cf. [11]–[14] above) in both the alternating and the nonalternating narrow classes. Thus, in order to know the conditions under which *dance* alternates, the child would have to encode two separate lexical entries for the verb *dance* (e.g. $dance_1$ belongs to the alternating class; $dance_2$ belongs to the nonalternating class).[24]

Second, the verb-class model assumes that verbs with multiple alloframes have a basic form and a derived form. It is not clear *a priori* how the child knows which form of a verb is basic and which is derived, particularly in the case of alloframes that (in English) show no morphological effect such as the locative and the lexical causative.

Elizabeth Ritter (personal communication) points out a third empirical problem with the verb-class model. The verb-class model treats one alloframe of a given verb as derived from another but cannot predict which alloframe is basic and which is derived. Consider the verb *break* as used in (53) and (54). If (53a) is more basic than (53b), as a verb-class model might assume, then what does the child do with pairs like those in (54), which have no "basic" form but do have the "derived" form?

(53) a. The vase broke.
b. John broke the vase.
(54) a. *The promise broke.
b. John broke the promise.

Fourth, the verb-class model assumes that all children end up with the same classes, which requires complex assumptions regarding semantic universals in order to ensure that different children arrive at identical

verb classes. Since the theory requires all speakers to generate the exact same semantic classes, the approach forces assumptions about universal semantic classification principles, which are at present virtually unknown and tentative.

Fifth, certain narrow classes are unlearnable in principle. Consider a verb like *dance*. Because its canonical use is an activity, *dance* should never enter into the broad semantic class of potentially causativizable verbs: activity verbs do not causativize. If the basic form of the verb *dance* is not a member of the causativizable broad semantic class, then it cannot become a member of any causativizable narrow class, which are all subsets of the broad class. The model thus predicts that the causativizations in (11)–(14) are unlearnable, and it will undergenerate the actual class of causativizable predicates.

One counterargument to the problem of the aforementioned theoretical undergeneration problem might be that the broad semantic classes are broad enough to pick up *dance* as belonging, for example, to the broad class of all intransitive verbs. But this counterargument simply takes the "semantic" out of the term "semantic class" by defining verb classes without regard to semantics. A second counterargument to the *dance* problem is to posit true polysemy: there are two verbs *dance*, one a single-argument activity verb, and the other a delimited verb taking a theme and a goal. But the unfortunate consequence of allowing rampant polysemy is that it predicts no semantic relation between $dance_1$ and $dance_2$.[25]

The more general problem with the verb-class model for the acquisition of verbal alloframes is that the approach offers no explanation of the processes underlying argument mapping. The verb-class model is purely descriptive. Because it does not find underlying explanations, it cannot identify what does or does not need to be learned.

4.2. *The event-structure model*

I propose that the verb-class model of verb acquisition be replaced by a model based on events rather than verb classes. An event-structure model of verb acquisition is mapped out in Figure 2. The event-structure model as outlined in section 1 builds on the insights of Tenny (1987, 1994), van Voorst (1988), Pustejovsky (1988), Grimshaw (1990), Dowty (1991), and van Hout (i.p.), who suggest that verb arguments are mapped into syntax on the basis of the role that they play in the event denoted by the verb. In this model, argument mapping follows directly from the structure of the event rather than from the semantics of the verb.

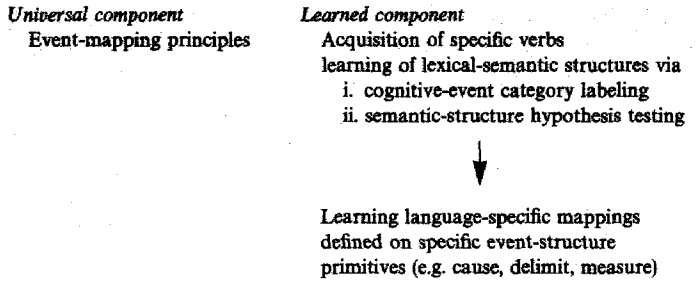

Figure 2. *Event structure model of the acquisition of argument mapping*

Like Pinker's verb-class model, the event-structure model of acquisition assumes that acquiring the semantics of verbs involves perceiving events and building the semantics of verbs via semantic hypothesis testing. It also adopts Pinker's assumption that the child has an innate set of universal mapping principles. However, the event-structure model argues that mapping is controlled by event-based principles rather than semantically based principles: the child uses mapping principles that are defined on specific event structure primitives, such as *cause*, *measure*, and *delimit*.

Like any other model of acquisition, the event-structure model requires that the child learn the specific meaning of each verb. Recent work by Ritter and Rosen (1996) suggests that some verbs have more semantic specification than others, and those that are more highly specified have a more rigid semantic interpretation and syntactic realization. It is possible that the more highly specified a verb is, the harder it is for the child to acquire the verb and its proper use(s).

Finally, the event-structure model assumes that the general event-based mapping principles are universal and, therefore, by hypothesis, innate. Some syntactic constructions are no doubt language-specific and therefore learned, but highly general (as opposed to the specific verb-by-verb information required of the semantic-class model). The language-specific learning is guided by universal principles. An example is the English particle *up*. The child must learn that *up* is a delimiting particle; once learned, the child should use *up* only with a delimiter. Universal principles will force the child to place that delimiter in object position. Only the language-specific "rules" must be learned.

Studies of the acquisition of argument mapping and alloframe variation have not focused on events or event-structure constraints. However, one experiment has presented clear evidence that young children used event-structure mapping principles to determine the position of locative argu-

ments. Gropen et al. (1991) found that children tend to place a location in object position when the location undergoes a change of state (measures the event in our terms). Gropen et al. devised an experimental task in which young children were taught nonsense verbs for novel actions that involved a moved object and a location. With one set of stimuli, children saw the location undergo a change of state, completely affected by the verb's action. With another set of stimuli, the child saw the same action, but with the location undergoing no change at all. When the children were prompted to describe the action, they tended to use the location-object alloframe when the location was affected, but not otherwise. The children cannot have used preexisting verb-class membership in order to determine which verbs allow the location-object alloframe because these were nonsense verbs, novel lexical items from the children's perspectives. Because there is no lexical representation for the nonsense verbs, neither verb classes nor semantic representations can determine nonsense-verb behavior. Gropen et al.'s results indicate that children use event-based mapping principles.

5. Conclusion

I have argued in this paper that verb classes have no cognitive or linguistic reality in the presentation or operation of the linguistic system. Instead, specific mapping principles connect event characteristics to syntactic position. Verb classes are not acquired and are not even represented in the linguistic system; although the verb-class model may partially describe the external behavior of verbs, the internal linguistic system contains no knowledge of verb classes. The child need only learn verb meanings and how a language encodes event information; universal mapping principles govern the relations between event properties and syntactic structure. Verb classification is not part of the acquisition task.

I have demonstrated, using two causative mapping patterns and the locative mapping pattern, that the verb-class model is not useful in understanding the syntactic behavior of verbs and the mapping relations between the lexicon and the syntax. The fundamental point is that it is wrong to group verbs into semantic classes that do and do not undergo a given "alternation." First, semantic class membership cannot explain circumstantial variation in a given verb's behavior. Verbs that canonically do not allow a given mapping will in the right circumstances; verbs that canonically do allow a given mapping do not in other circumstances. Thus, verb-class membership cannot readily capture the linguistic facts. Second, although classifying and subclassifying verbs identifies patterns

of behavior, the resulting verb classes are purely descriptive rather than explanatory. The discussion of causatives and locatives in sections 2 and 3 showed that there is a much deeper explanation of the facts than simple class membership. The variation in the behavior of given verbs derives from their flexibility in event denotation. The discussion of causatives and locatives establishes that mapping relations are properly defined over event-structure information. It is wrong to view the various uses of verbs as alternations that derive one representation from another.

Returning to the initial discussion of the alignment of arguments and the problems that verbal alloframes raise, understanding the syntax of verbal alloframes will lead us toward redefining alignment principles such as U(T)AH or the AIH, and alloframe variation in the grammar. In addition to the causative and locative mappings addressed here, recent work on mapping patterns of psych predicates (Grimshaw 1990), unaccusatives (Levin and Rappaport Hovav 1995), causatives (Ritter and Rosen 1993a, 1993b), optional and unexpressed objects (van Hout i.p.), and a host of other direct object/indirect object shifts (Ghomeshi and Massam 1994) shows that there are event-structure constraints on syntactic mapping. The arguments made in this paper suggest that there is in fact a rigid universal set of mapping principles like U(T)AH originally hypothesized. However, the universal mapping principles are defined off of event-structure primitives; the semantic or thematic primitives that U(T)AH is based on are not in principle capable of constraining argument realization. Research on argument realization must focus on identifying event roles and their relation to the syntax.

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Notes

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1. Another approach to the variability of argument positions in syntactic structures is to posit that thematic roles map uniformly and all variability is derived by syntactic movement (cf. Baker 1988).

2. An alternative model would argue that arguments map freely into syntax, and the event interpretation is determined by the syntactic position. This is the approach taken recently by Ghomeshi and Massam (1994) and by Borer (1993). Although there is an important and very interesting theoretical distinction between a model that assumes the existence of an event structure that mediates the syntactic mapping and one that assumes free mapping and syntactic determination of event information, this distinction is not crucial for the points made in this paper. What is crucial is the link between the role an argument plays in the event and the syntactic position of that argument.
3. Tenny (1994) uses the term "aspect" to refer to the contours of the event that are encoded by the internal arguments. I prefer to use the term "event" for two reasons: I will be including the event interpretation of the external argument; and there is general confusion between "aspect" such as progressive and perfective and "aspect" in the sense of event contours.
4. Goldberg (1995) presents a theory of argument realization that removes the argument structure from the lexical representation of the verb. She argues for the existence of argument "constructions" that exist independent of the lexicon. A major difference between Goldberg's approach and the one taken here is that her constructions are not motivated by event structure.
5. The use of *walk* in (i) is perfectly grammatical:

   (i) Sue walked the dog.

   However, as Elizabeth Ritter (personal communication) has convincingly argued, this form of the verb really means 'exercise' and not 'locomote using the walking gait'.
6. Hoekstra (1984) and Rosen (1984) have made the same point for similar verbs in other languages.
7. I assume also that the examples in (10) are at the very least ambiguous between an activity and a delimited reading. The expectation is that only the delimited use allows causativization. Notice also that manner of motion is not synonymous with a delimited reading. As an anonymous reviewer points out, the verb *drive* describes a manner of motion but can be used either as an ongoing activity or as a delimited event:

   (i) a. Bill drove around aimlessly for 5 hours.
   b. Bill drove Fred to the station (*for 5 hours).

8. Delimited transitive verbs do not causativize, as (i) shows:

   (i) a. Bill ate an apple.
   b. *John ate Bill an apple.

   It is possible that (ib) is ungrammatical for case-theoretic reasons.
9. See also van Hout (i.p.) for a similar argument.
10. Levin and Rappaport Hovav (1995) point out that these verbs can take the goal argument in the "way" construction, for them a test for membership in the unergative class:

    (i) a. John smiled his way to Dodge City.
    b. ?John glowed his way to Dodge City.

    Even so, these verbs do not allow causativization:

    (ii) a. *Bill smiled John his way to Dodge City.
    b. *Bill glowed John his way to Dodge City.

    The explanation for this fact would be that, even with the goal phrase in the "way" construction, these verbs do not denote a means of transport but simply modify a

peripheral manner during transport. An anonymous reviewer also points out that the case-theoretic explanation mentioned in note 8 may also hold.

11. This example was pointed out by an anonymous reviewer.
12. This example allows either the delimited modifier (*in 10 minutes*) or the nondelimited modifier (*for 10 minutes*). In the two cases, I contend that the event denoted is the same, but the modifier picks out different aspects of the event. The delimited modifier refers to giving the child a treatment, whereas the nondelimited modifier refers to the entire process of treatment.
13. Levin and Rappaport Hovav (1995) call these the verbs of existence and appearance. They also note that these verbs are consistently intransitive, failing to undergo causativization.
14. See also Levin and Rappaport Hovav (1995) for arguments against Chierchia's (1989) particular account of the process of deriving inchoatives from transitives.
15. Notice again that it is not a property of the verb itself that determines the syntactic frames it appears in; it is rather a property of the verb and its object.
16. In general, however, nonagentive verbs can combine with *have* and receive an experience interpretation. See Ritter and Rosen (1993b) for details.
17. Affectedness here must be understood in a loosely defined sense. For verbs such as *load* and *pack*, it means that some container must be full, whereas for verbs like *smear*, *spray*, or *drizzle*, it means to distribute material over some large-"enough" area. See Pinker (1989) and Jackendoff (1990) for a discussion of these matters. Affected locations might best be defined as follows:

    (i) Material fills a container to a point beyond which the state of the entity can no longer be changed by the action, or
    (ii) Material covers a distributed area of a flat surface to a point beyond which the state of the entity can no longer be changed by the action.

18. The theme-object alloframe may denote either a delimited or an undelimited event, often depending on the properties of the direct object:

    (i) a. Delimited: The children taped the pictures onto the wall in an hour.
        b. Undelimited: The children taped pictures onto the wall for an hour.

    The location-object alloframe does not share this flexibility in delimitedness. When a bare plural appears in direct object position, the event receives an interpretation of repeated events of taping, each repeated event being completed:

    (ii) The children taped up walls with pictures for an hour.

19. To the extent that the theme-object alloframe allows the particle, the particle forces the object to delimit the event. (40a), (41a), and (42a) are marginally grammatical but only under the reading in which the material measures the event. Notice that *fill* also allows the particle to be added:

    (i) Bill filled up the glass with water.

    But this is to be expected: since both the verb and the particle require delimitation, they are both compatible with the glass delimiting the event.
20. Notice that in the location-object alloframe, the material cannot naturally take an amount modifier. This is because the amount of material is determined by the affectedness of the location, not the material.

    (i) a. ??Bill filled the glass with some/a little water.
        b. ??The storm blanketed the wheat fields with some/a little snow.

21. Note that with a verb like *fill* or *blanket*, there is aspectual information in the LCS representation of the verb (or at least information in the LCS that serves to constrain the aspect). Thus, it seems that not all aspectual information resides outside the lexicon; the lexical representation has the power to constrain the set of event structures the verb can enter into.
22. My guess is that those speakers who found (49) ungrammatical were not able to ignore the lexical semantics in extending verb use.
23. Hoekstra and Mulder (1990) also point out that you get a different aspectual classification of the two locative alloframes. However, they attribute the aspectual variation as deriving from two distinct argument structures and argument realizations. The present work views the event denotation as fundamental, and the argument realization as deriving from the alternative event denotations.
24. See Gropen (1993) for an account that proposes that every distinct use of a verb is actually use of a distinct lexical item. However, in the absence of a constrained theory of polysemy, I will not entertain such an account. In particular, the acquisition problem simply is not solved by assuming that the child must acquire multiple independent lexical entries for the various uses of the verb *dance*, for example.
25. An anonymous reviewer suggests that one could posit polysemy that is predictable, so that the two verbs *dance* are not totally unconnected. This would explain the near-paraphrase relation between the two uses. However, predictable polysemy implies derivation by general rule. If the two uses are derived by general rule (or one derived from the other), then there is no reason to list both in the lexicon.

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